**ViewPlus - American Physical Society Collaboration: Making Scholarly Publications Accessible**

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**Introduction**

ViewPlus has collaborated with the American Physical Society (APS) to demonstrate feasibility of publishing APS journals in an accessible DAISY form. APS presently uses an XML (eXtensible Markup Language) work flow, and it proved to be relatively easy to transform APS XML to DAISY XML, thus making all text and math accessible. APS figure formats are PostScript however, not XML. ViewPlus developed a method for transforming PostScript figures to accessible SVG (Scalable Vector Graphics) form with all text in good SVG format. The full DAISY XML file in which math is coded as MathML and figures as accessible SVG provides an excellent way for everybody to read Physics articles on line. It has important advantages for mainstream readers [1], and is very accessible to people who are blind or have other severe print disabilities. Software is presently being developed that will permit APS to begin DAISY publishing as an alternate to PDF. Most other scholarly publishers are following the APS lead into XML publishing, and they are expected to follow APS lead into DAISY publishing as well. This presentation will demonstrate accessible text, math, and figures from Physical Review Letters, the flagship journal of APS. In addition to demonstrating full accessibility on a PC computer, math and text reading will be demonstrated on a Victor Stream portable DAISY player.

**Reading Scientific DAISY Articles**

A DAISY XML version of a Physical Review Letter article may be read by a blind person using a PC and either a DAISY reader software application or with Internet Explorer and a screen reader. Several companies are extending their DAISY software readers to provide access to math and graphics. The MathML extension to DAISY was adopted formally by DAISY in February, 2007, but most DAISY software is not yet MathML-aware. SVG has always been an acceptable graphics format for DAISY XML, but ViewPlus has only recently created the software necessary to make DAISY SVG accessible to blind users through its IVEO [2-4] technology. It has offered the software to DAISY reader manufacturers at no cost, and several companies are presently adding them to their DAISY reader software applications.

Reading DAISY XML files with Internet Explorer requires a XSLT transformation from DAISY format to XHTML format. Internet Explorer needs to have the free MathPlayer plug-in installed in order to display the math and the free ViewPlus IVEO SVG plug-in in order to display SVG and to provide the links that open it in the IVEO Viewer. MathPlayer is available from Design Science at http://www.dessci.com, and the IVEO plug-in can be made available on request from ViewPlus. The free IVEO Viewer may be obtained from <http://downloads.viewplus.org/software/IVEOViewer/>.

**Reading DAISY SVG Graphics**

No matter what one uses for reading the text and math of a DAISY scientific article, the user finds a SVG link at each graphic. Clicking that link opens the graphic in the IVEO Viewer. When one selects text labels on the figure, those labels speak. Selecting a graphical object speaks the title field of that object. The user may also hear a description of the figure or of any graphical object by pressing appropriate hot keys. These graphical object titles and all descriptions are included in the file but are not visible. They are generally inserted by the author, an editor, or can be inserted automatically when saving as DAISY SVG from authoring software. In addition to these standard SVG capabilities, the figure can have data stored in special DAISY data fields. Data can be displayed in IVEO Viewer visually or by one of several audio techniques including speaking data points and by playing audio tone graphs of quasi-continuous data.

Blind users and others with severe print disabilities need a tactile copy to find the text labels and graphical objects. The "Audio-touch" access method, invented and developed by Prof. Donald Parkes [5, 6], is known to provide excellent access to people with severe print disabilities. Tactile copy may be created easily by printing the graphic from the IVEO Viewer to a ViewPlus embosser. Many people find it helpful to have a color image of the graphic superimposed on the tactile copy. Such color embossed copy can be made with the ViewPlus Emprint SpotDot color embosser.

The tactile copy can be touched by users to select text labels or graphical objects. The position of the touch must be communicated back to the computer by some kind of external hardware. A touchpad is currently being used for this purpose, but ViewPlus is developing several other types of hardware including an inexpensive digital pen interface. A prototype will be demonstrated. The choice of hardware is up to the user. Excellent "Audio-Touch" access is provided by any hardware choice.

**Further Developments Enabling DAISY Scholarly Publications**

Transformation of the present APS XML (text and math) to DAISY format is straightforward, but figure transformation is not. As part of the first research project ViewPlus developed a transformation methodology by which PostScript images can be transformed automatically into moderately accessible DAISY SVG (Scalable Vector Graphic) format. The transformation process requires using OCR (Optical Character Recognition) for many figures in order to obtain proper SVG text in figures. SVG text is accessible, but images of text are not. OCR is not 100% accurate, so some human editing is required to obtain perfect text and math on figures. This additional editing time needs to be minimized in order to make it feasible for scholarly publishers to be able to publish DAISY XML electronic files without adding considerably to their costs.

Initial DAISY journals will include only "minimally accessible" figures for which all text labels are accessible but which include no additional meta data such as object titles and descriptions. Improved authoring and editing techniques will permit more meta data to be included and consequently make figures more accessible. The structure and meta data of excellent DAISY SVG figures also make them extremely useful for such mainstream purposes as classifications and good search ability, as well as the possibility of data graphs being their own data archive.

The next step is to develop software and procedures necessary for scholarly publishers to produce and deliver minimally-accessible DAISY journal articles to their subscribers. Making these DAISY XML scholarly publications available will be a spectacular accomplishment, but it is only the first step in a process leading eventually to a fully XML work flow and to more than-minimal DAISY XML publications. The original ViewPlus-APS team has been joined by other organizations to facilitate such development. These include three composition organizations, the American Institute of Physics, Beacon PMG, and Aptera who will assist in developing software and new composition protocols. The archiving company Portico will create a process that ensures easy archiving of the new SVG images.

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